

**structural**  
TECHNOLOGIES

# TRANSPORTATION SOLUTIONS

MAKING CIVIL INFRASTRUCTURE STRONGER & LAST LONGER

[www.structuraltechnologies.com](http://www.structuraltechnologies.com)



Cable-Stayed Bridges



Suspension Bridges




## Turnkey Transportation Solutions

From investigating the root cause of deterioration or structurally deficient transportation infrastructure, to designing technology driven solutions and implementing the needed repairs, STRUCTURAL TECHNOLOGIES along with other Structural Group Companies, provides turnkey solutions for strengthening and extending the life of existing transportation infrastructure.

For new construction, STRUCTURAL TECHNOLOGIES also offers a wide range of products, systems and services that enhance the design and extend the life cycle of new bridges. These solutions include a full range of post-tensioning products and design services as well as construction systems that enhance speed and constructability.

### OUR TEAM



**Service Life Modeling &  
Durability Design**

Through a joint venture partnership with SIMCO Technologies, STRUCTURAL TECHNOLOGIES brings the US transportation industry SIMCO's STADIUM® the standard for concrete service life modeling of both new and existing concrete structures worldwide. This powerful tool utilizes information gathered on the condition of an existing structure or proposed new design, with the durability design expertise of SIMCO to create solutions that meet performance and service life requirements.



**Products &  
Engineering Support**

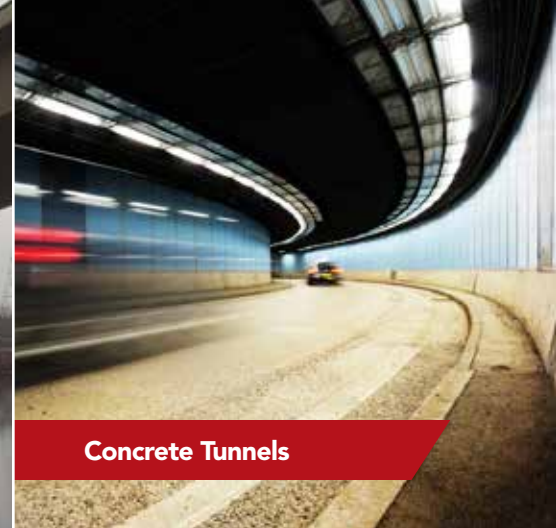
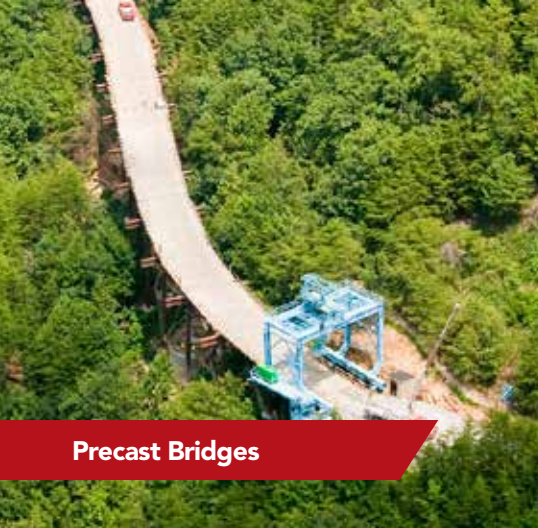
STRUCTURAL TECHNOLOGIES is firmly committed to making civil infrastructure stronger and last longer. We bring state-of-the-art technology driven products and design support to the solution building process of infrastructure repair. By developing and integrating our products and engineering support with our contracting licensees' repair, maintenance and new construction services, we bring turnkey value-added solutions to owners, engineers and contractors. Our technology team supports throughout the solution building life cycle from investigation to design and through construction.



**Construction Services**

STRUCTURAL and PULLMAN, contracting licensees' of STRUCTURAL TECHNOLOGIES, provide the repair services integrating the products, design solutions and engineering support of STRUCTURAL TECHNOLOGIES and its engineering partners. As part of the Structural Group family of companies, we provide turnkey industry-leading repair and maintenance solutions in partnership with engineers and contractors. With offices around the world, our contracting licensees provide clients with the reassurance of safe and quality repairs and installation of our technology solutions.





**Precast Bridges**

**Cast-in-Place Bridges**

**Concrete Tunnels**

By specializing in making civil infrastructure stronger and last longer, **STRUCTURAL TECHNOLOGIES** provides a broad range of investigation services, specialty design support, products and construction services to make us your partner of choice when you need solution building expertise for your transportation infrastructure challenge. Not only are we an ideal partner for design build repair and service life extension projects, but also for improving the design and durability of new bridges, tunnels and related civil infrastructure.

#### **Comprehensive Support for Bridges, Tunnels and other civil infrastructure**

<b>CAPABILITY / SERVICE</b>	<b>INVESTIGATION SUPPORT</b>	<b>DESIGN SUPPORT</b>	<b>TECHNOLOGY / PRODUCTS</b>	<b>REPAIR &amp; MAINTENANCE</b>	<b>NEW CONSTRUCTION</b>
Deterioration Mechanism Investigation / Mitigation	X	X			
ASR Investigation / Mitigation	X	X			
Asset Management 3D Modeling	X	X	X		
Acoustic Monitoring	X	X	X	X	X
SIMCO STADIUM Service Life Modeling	X	X	X	X	X
SIMCO Durability Engineering	X	X	X	X	X
Industrial Rope & Conventional Access	X		X		
Specialty PT / Stay Cable Investigation	X				
Stay Cable Systems	X	X	X	X	X
VSL Post-Tensioning Systems		X	X	X	X
PT Element Design		X	X	X	X
PT Repair	X	X	X	X	
Armoring Systems	X	X	X	X	X
Specialty Corrosion Investigation	X				
Galvanic Cathodic Protection		X	X	X	X
Impressed Current Cathodic Protection		X	X	X	X
Strengthening Systems		X	X	X	
Product Installation & QA/QC		X	X	X	X
Concrete Repair	X	X	X	X	
Waterproofing	X	X	X	X	
Hydrodemolition			X	X	
Heavy Lifting, Lowering & Sliding		X	X	X	X
Specialized Construction Systems		X	X	X	X



## Enhanced Investigation

*Whether it's part of a proactive program or in response to identifying structural or deterioration issues, STRUCTURAL TECHNOLOGIES offers a range of specialized investigation services to assist engineers with the assessment of civil infrastructure. Our specialized services are designed to identify the true root cause of deterioration as well as provide more comprehensive quantifiable information to aid in the solution building process.*

Working through engineering partners, STRUCTURAL TECHNOLOGIES', SIMCO and our contracting licensees are able to support engineers in the investigation process in many ways, including:

- Traditional access support
- Industrial rope access (IRA)
- Drone and other digital capture and modeling capabilities
- Specialty corrosion and post-tensioning investigation
- Load testing and finite element analysis
- Advanced concrete testing using STADIUM® service life modeling

Our NACE certified corrosion experts and PTI certified post-tensioning experts provide specialty investigation and testing of concrete and steel structures including post-tensioning and stay cable systems. Evaluations involve a variety of non-destructive and exploratory testing methods to determine the state of components and the surrounding concrete.

Through testing and STADIUM® service life modeling, SIMCO can provide estimated remaining service life based on deterioration levels and exposure conditions. Through our exclusive partnership with Pure Technologies, our team provides state-of-the-art technology for ongoing monitoring and precise detection of wire breaks in steel wire, strand or cable.

### Common Bridge Problems

- Corroding steel reinforcement and members
- Corroding PT tendons, anchorages
- Damage due to overloads or accidents
- Deteriorating concrete, delamination, spalling
- Freeze thaw damage
- Stress corrosion
- Worn and defective joints
- Worn bridge decks / overlayments
- Worn bearings and slide plates
- Defective workmanship
- Design defects
- Water leakage through cracks and joints
- Excessive movement
- Fire damage



### Field & Laboratory Testing Capabilities:

<b>Standard Non-Destructive Testing</b>		
<ul style="list-style-type: none"> <li>• Visual inspection - site survey</li> <li>• Rebound hammer testing</li> <li>• Thermal imaging</li> </ul>	<ul style="list-style-type: none"> <li>• Ultrasonic pulse velocity testing</li> <li>• Ground penetrating radar (GPR)</li> <li>• Pachometer</li> </ul>	<ul style="list-style-type: none"> <li>• Ultrasonic thickness testing of structural steel members</li> <li>• Impact echo testing</li> </ul>
<b>Standard Exploratory Testing</b>		
<ul style="list-style-type: none"> <li>• Exploratory excavations</li> <li>• Sample extraction</li> </ul>	<ul style="list-style-type: none"> <li>• Load testing</li> </ul>	<ul style="list-style-type: none"> <li>• Geotechnical analysis</li> </ul>
<b>Specialty Post-Tensioning Testing</b>		
<ul style="list-style-type: none"> <li>• Acoustic testing/monitoring</li> <li>• Acoustic emission testing</li> <li>• Infrared thermography</li> </ul>	<ul style="list-style-type: none"> <li>• Magnetic flux leakage (MFL)</li> <li>• Borescope inspection</li> </ul>	<ul style="list-style-type: none"> <li>• Grout material sampling and testing</li> <li>• Strand sampling</li> </ul>
<b>Specialty Corrosion Testing</b>		
<ul style="list-style-type: none"> <li>• Corrosion damage surveys</li> <li>• Concrete contamination (chloride and carbonation analysis)</li> </ul>	<ul style="list-style-type: none"> <li>• Concrete resistivity</li> <li>• Electrical continuity testing</li> </ul>	<ul style="list-style-type: none"> <li>• Linear polarization resistance (LPR)</li> <li>• Half cell potential mapping</li> </ul>
<b>Laboratory Testing</b>		
<ul style="list-style-type: none"> <li>• pH testing/carbonation depth</li> <li>• Chloride ion content</li> </ul>	<ul style="list-style-type: none"> <li>• Sulfate ion content</li> <li>• Compressive strength testing</li> </ul>	<ul style="list-style-type: none"> <li>• ASR testing</li> <li>• Service life modeling</li> </ul>

### Single Source - Integrated Investigate-Design-Build (IDB) Solutions

STRUCTURAL TECHNOLOGIES' capabilities combined with other Structural Group Companies provide single source turnkey support to project teams looking to benefit from an integrated design build solution building process.

This approach provides a seamless process from initial design through installation with single-source responsibility. Our team works with engineers to assist them with inspection, solution development, engineered products, budgeting and constructability analysis. Project teams have access to a wide array of solutions as well as both technical and construction teams capable of value engineering custom repair solutions. Owners gain the reassurance of skilled contractors to implement repairs and install solutions to extend the life of existing structures and enhance the performance of new structures.





## Durability Engineering & Service Life Modeling

A challenge faced by owners, engineers and contractors of transportation infrastructure is combating concrete deterioration. Through STRUCTURAL TECHNOLOGIES' investment and partnership with SIMCO, our team offers industry leading service life prediction and durability modeling services to engineers and their clients.

Whether constructing a new structure with a proactive service life design approach or reactively repairing and rehabilitating a structure, understanding durability and deterioration mechanisms allows for better decisions, more cost effective solutions and optimization of service life.

### Service Life Modeling / Design for Existing Structures

By incorporating SIMCO's durability modeling into the investigation phase of a project, engineers can better understand the remaining service life of the structure without interventions and optimize the solution. With the STADIUM® modeling software we can predict: residual service life or time to failure without corrective measures and predictive service life extension for repair strategies.

### Durability Design for New Construction

Utilizing SIMCO's STADIUM® software and capabilities, firms gain a science-based approach to calculating durability and service life. From spec support to optimizing concrete mixtures and selecting construction methods, we provide customized durability plans to meet new construction service life requirements.

### Support for Existing Structures:

- Inspection & condition assessment
- Repair design & specifications
- Optimization of concrete repair
- QA/QC management during repairs
- Inspection & maintenance plans
- Residual service life evaluation
- Repair solution service life modeling

### Support for New Structures:

- Preliminary analysis & identification of durability criteria
- Service life analysis & durability plan
- Drafting & review of specifications
- Optimization of concrete mixtures
- Selection of construction methods
- QA/QC management & troubleshooting during construction



### Industry-Leading Service Life Prediction Tools

The U.S. Department of Defense recognizes STADIUM® as the only accurate solution for the prediction of long-term behavior of reinforced concrete structures exposed to a wide range of aggressive environments. Unlike other models, STADIUM® considers a wide range of physical and chemical factors that influence long-term performance and overall service-life.

SIMCO's STADIUM® Bridge Deck Tool is used for testing bridge deck deterioration, managing reinforced concrete bridge decks, and for calculating and predicting the performance and service life of the structure.



## Acoustic Monitoring

**SoundPrint® Acoustic Monitoring** is a wire break detection system designed by Pure Technologies, a world leader in acoustic monitoring and reporting systems, which utilizes acoustic sensors and proprietary hardware and software to detect and locate wire failures in prestressing steel wire, strand or cable through continuous, non-intrusive remote monitoring.

As the exclusive licensee of Pure Technologies' Soundprint® technology within the US Transportation market, STRUCTURAL TECHNOLOGIES and Pure can ensure the long-term integrity of post-tensioned, pre-tensioned, suspension and cable-stayed bridges. For maintenance planning and long-term investigation cost-savings, this technology can precisely and immediately detect wire breaks and seamlessly integrate into an owner's bridge management system.



### System Features

- Data Acquisition System (DAQ)
- Custom Designed Acoustic Sensors
- Junction & Marker Boxes
- Cabling & Connectivity

### Monitoring Process:



**Detecting wire breaks:** Piezoelectric accelerometers and acoustic fiber optic cables are reliable methods for detecting acoustic waves generated by wire failures in the form of surface vibrations in the structure.



**Data Capture:** The data acquisition system (DAQ) installed on site can handle thousands of multiplexed sensors placed throughout a structure. The hardware and software filter the data with real-time processing and reject superfluous acoustic event data.



**Data Transmission:** Onsite filters minimize data capture to events with wire failure characteristics. Data is transmitted via secure internet connection to central processing server for data analysts review.



**Data Processing:** Data analysts review events for wire failures, as well as anomalous sensor signals. Wire events are identified by frequency, spectrum, energy, propagation velocity, and attenuation. Locations are determined by relative arrival time of signal at the sensor location.



**Reporting:** Upon classification of a wire event, an email alert is sent directly to the client. A secure client website offers on demand reporting of an event history. Reports are delivered on a periodic basis as requested.



## Strengthening Solutions

*STRUCTURAL TECHNOLOGIES' strengthening products and technical services to restore or enhance the load-carrying capacity of reinforced concrete and steel structures can be used stand-alone, or combined together, to solve nearly any project requirement.*

Whether upgrading a bridge structure to meet new code requirements, to combat progressive deterioration, or provide remediation of past design or construction challenges, our team of subject matter experts provide comprehensive solutions to achieve project goals.

Our in-house team of strengthening experts collaborate with designers, contractors, and owners to develop customized strengthening solutions to meet budget and schedule constraints. To restore the structural capacity of bridges, STRUCTURAL TECHNOLOGIES offers various fiber-reinforced polymer (FRP) composite, concrete enlargement and overlay, post-tensioning and micro-reinforced concrete systems. Our products also have the ability to be used stand-alone, together or in conjunction with other commercially available products, allowing for flexible solutions.

Together with our contracting licensees, our team offers state-of-the-art technology, experienced and trained installers, along with proven quality control programs to successfully provide solutions for new and existing bridge structures.

### Strengthening Solutions For:

- Change in Code Requirements
- Seismic Retrofit
- Increased Loads
- Missing or Misplaced Reinforcement
- Deterioration
- Low Concrete Strength
- New Penetrations and Openings
- Force Protection





### V-Wrap™ FRP Composite Systems

These state-of-the-art composite systems utilize lightweight, durable, high-strength carbon and glass fibers bonded with adhesive resins. Applications with limited access and/or structures with complex geometries benefit from this versatile, low impact and environmentally compliant system.



### Tstrata Enlargement Systems™

These systems provide additional reinforced concrete that is fully bonded to existing structural members. Our systems combine specific surface preparation, specialized materials, and pressurized formwork to produce monolithic concrete enlargements to increase or restore the load-carrying capacity, ductility and seismic resistance to a variety of concrete structures.



### External Post-Tensioning Systems

These strengthening systems consist of tendons installed externally to the structural element and may be placed in grouted ducts to improve durability and/or fire resistance. STRUCTURAL TECHNOLOGIES provides comprehensive design support to develop system detailing, anchorage requirements and reinforcement.



### DUCON® Micro-Reinforced Concrete Systems

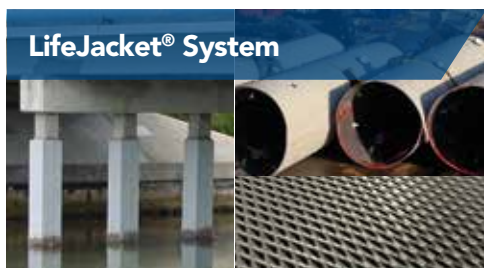
These high-performance strengthening and force protection solutions designed for extreme load resistance and energy absorption. DUCON® combines an ultra, high-performance grout with densely layered MicroMat® steel reinforcement.

*DUCON® and MicroMat® trade names and patents are owned by DUCON GmbH and are distributed by STRUCTURAL TECHNOLOGIES for force protection and strengthening applications.*



## Corrosion Protection Solutions

*STRUCTURAL TECHNOLOGIES offers a full line of cathodic protection systems and has a staff of qualified professionals to help you design and customize your system and oversee installation by our licensed contracting companies.*



The LifeJacket® Galvanic Cathodic Protection System uses a proprietary zinc mesh anode on the inside face of a custom fabricated stay-in-place fiberglass shell. The fiberglass shell serves as a form for placement of cementitious repair materials for cross-section loss, adding or restoring capacity and protecting the structure. Customizable, maintenance free with no outside power source required, this galvanic system self-adjusts to changes in temperature, humidity and concrete resistivity.



ElectroTechCP™ Metalized Cathodic Protection (MCP) systems deliver uniform corrosion protection to embedded reinforcing steel in concrete. Like other galvanic systems, the MCP system does not require external power. This spray applied anode (often referred to as metallizing) can be coated for aesthetic purposes or can be reapplied for extended service life. The MCP System protects embedded steel in concrete members as well as exposed steel members of structural steel.



ElectroTechCP™ C-Wall System is a unique galvanic cathodic protection solution for restoration and long-term protection of sea wall piles, bridges and other marine structures. Made from a specialized concrete composite, the system features a durable, impact-resistant outer shell that is lined with an expanded zinc mesh anode. The system may be fabricated to any size, shape or color to protect steel piles or embedded concrete reinforcement.





### ElectroTechCP™ EZ-Anode Systems

ElectroTechCP™ EZ-Anode Systems are customizable galvanic cathodic protection solutions consisting of zinc mesh and a patented conductive mortar. The system is highly flexible as it is custom built and installed in the field for the long-term protection of reinforced concrete corrosion. Along with the base system, versions for different applications include:

### EZ-Column System



STRUCTURAL TECHNOLOGIES' ElectroTechCP™ EZ-Column System leverages EZ anode technology for concrete columns suffering from corrosion-induced damage.

### EZ-Joint System



STRUCTURAL TECHNOLOGIES' ElectroTechCP™ EZ-Joint System leverages EZ anode technology for concrete surrounding expansion/construction joints.

In addition to galvanic cathodic protection systems, STRUCTURAL TECHNOLOGIES also offers impressed current cathodic protection (ICCP) solutions to protect transportation infrastructure. Anodes and ribbons are installed throughout a structure and a Direct Current (DC) is passed through them to prevent corrosion.

### ElectroTechCP™ ICCP Systems



ElectroTechCP™ ICCP systems are driven and controlled by proprietary power and monitoring devices that deliver and monitor precise levels of protective current to embedded steel within concrete structures. Variable power supplies and sophisticated controllers allow for different levels of protection that can be continually adjusted within the structure.

The advanced controllers allow for remote monitoring and will alert operators when conditions change and need adjustments.





**struc'tural**  
TECHNOLOGIES

## Turnkey Repair & Installation Services Through Contracting Licensees

*Our team provides turnkey support throughout the IDB (Investigate Design Build) process. This includes the self-performance of the solution and the installation of our products through our in-house contracting licensees, STRUCTURAL and PULLMAN. This turnkey set of capabilities makes us an ideal addition to your team early in the solution building process.*

STRUCTURAL and PULLMAN are skilled at installing our technology solutions. These ACI, ICRI and PTI award winning firms have performed more concrete repair and strengthening projects than any other firm in the United States. Their expertise adds to the constructability of the solution, upfront knowledge of cost and potential value engineering options.

Project teams carefully plan each project to address all areas of concern and add value to every part of the project life cycle. With offices across North America and the Middle East, STRUCTURAL and PULLMAN have the flexibility and manpower to work anywhere in these areas and match work schedules to project needs. Regardless of the conditions, our team's focus is on quality, on-time performance with the highest standard of safety for both our workforce and our customers.

Working on bridges, tunnels, and other civil infrastructure requires an understanding of the unique challenges, demands, and requirements of these structures. We understand the importance of maintaining access, minimizing disruption and maximizing safety when working on transportation projects.

**struc'tural**  
**PULLMAN**

### Self-Performing Repair & Maintenance Services

- Concrete Repair
- Post-Tensioning Repair
- Structural Strengthening
- Corrosion Control
- Moisture Control & Waterproofing

### Structures

- Bridge Decks, Pylons, Columns, Piers & Stay Cables
- Tunnels
- Railways
- Airports & Terminals
- Highway Interchanges
- Ports, Docks & Piers
- Locks & Dams



*Industry Leading Hydrodemolition & Surface Preparation Services critical to quality repair are another one of our in-house capabilities.*



These services are provided by Rampart Hydro Services, another Structural Group Company. Rampart is the premiere hydrodemolition contractor in the United States, with the industry's largest fleet of specialized vehicles. This in-house capability streamlines the repair process and provides proper surface prep for major repair and bridge deck replacement projects.



Our contracting licensees' in-house self-performance capabilities ensure control over critical path activities, keeping fast track projects on schedule, minimizing downtime of critical infrastructure. Combined with the solution building capabilities and products of STRUCTURAL TECHNOLOGIES, our overall team provides the added value of single source responsibility and enhanced quality control.

#### Services

- Hydrodemolition
- Surface Cleaning
- Coating Removal
- Rubber & Paint Removal
- Cleanup & Debris Removal
- Water Treatment & Filtration





**www.structuraltechnologies.com**  
**410-850-7000**

**struc'tural**  
**TECHNOLOGIES**

### About STRUCTURAL TECHNOLOGIES

STRUCTURAL TECHNOLOGIES is firmly committed to its mission of making structures stronger and last longer. We develop and integrate products and engineering support services with our contracting licensees' construction services to provide value-added solutions to owners, engineers and contractors.

### State-of-the-Art Products

For existing infrastructure, STRUCTURAL TECHNOLOGIES' products and solutions repair deterioration or damage, and enhance structures in order to extend life or comply with change of use requirements. For new construction, our products and solutions can improve the performance, protect and extend the life of structures, as well as correct construction defects.

### Solution Building & Design Assist Services

STRUCTURAL TECHNOLOGIES works closely with our clients to consider all aspects of a project. Our Solution Building teams have the experience to assist engineers in selecting the proper product, providing design assist services as well as cost and constructability consulting to ensure the best possible solution.

### Turnkey Repair & Maintenance Solutions

When teamed with one of STRUCTURAL TECHNOLOGIES' repair and maintenance licensees, STRUCTURAL TECHNOLOGIES offers turnkey design build solutions.

### Corporate Headquarters

10150 Old Columbia Road • Columbia, MD 21046 • Phone: 410-850-7000

**Manufacturing Centers:** Dallas, TX • Houston, TX • Springfield, VA • Ft. Lauderdale, FL

### Products & Systems

- Post-Tensioning
- Stay Cable
- Strengthening
- Force Protection / Armoring
- Corrosion Control
- Moisture Control
- Concrete Repair Materials
- Modeling & Monitoring
- Construction Systems

### Engineered Product Support

- Budget Development
- Specification Assistance
- Application Engineering
- Design Assist